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Pollination Research 2012

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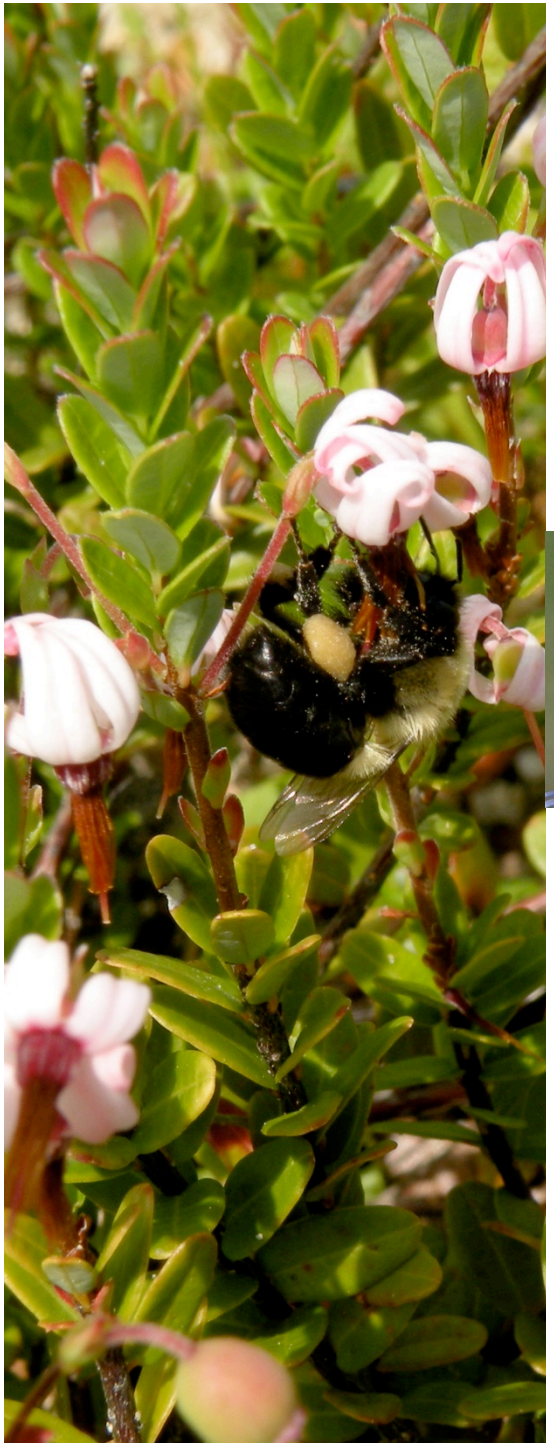


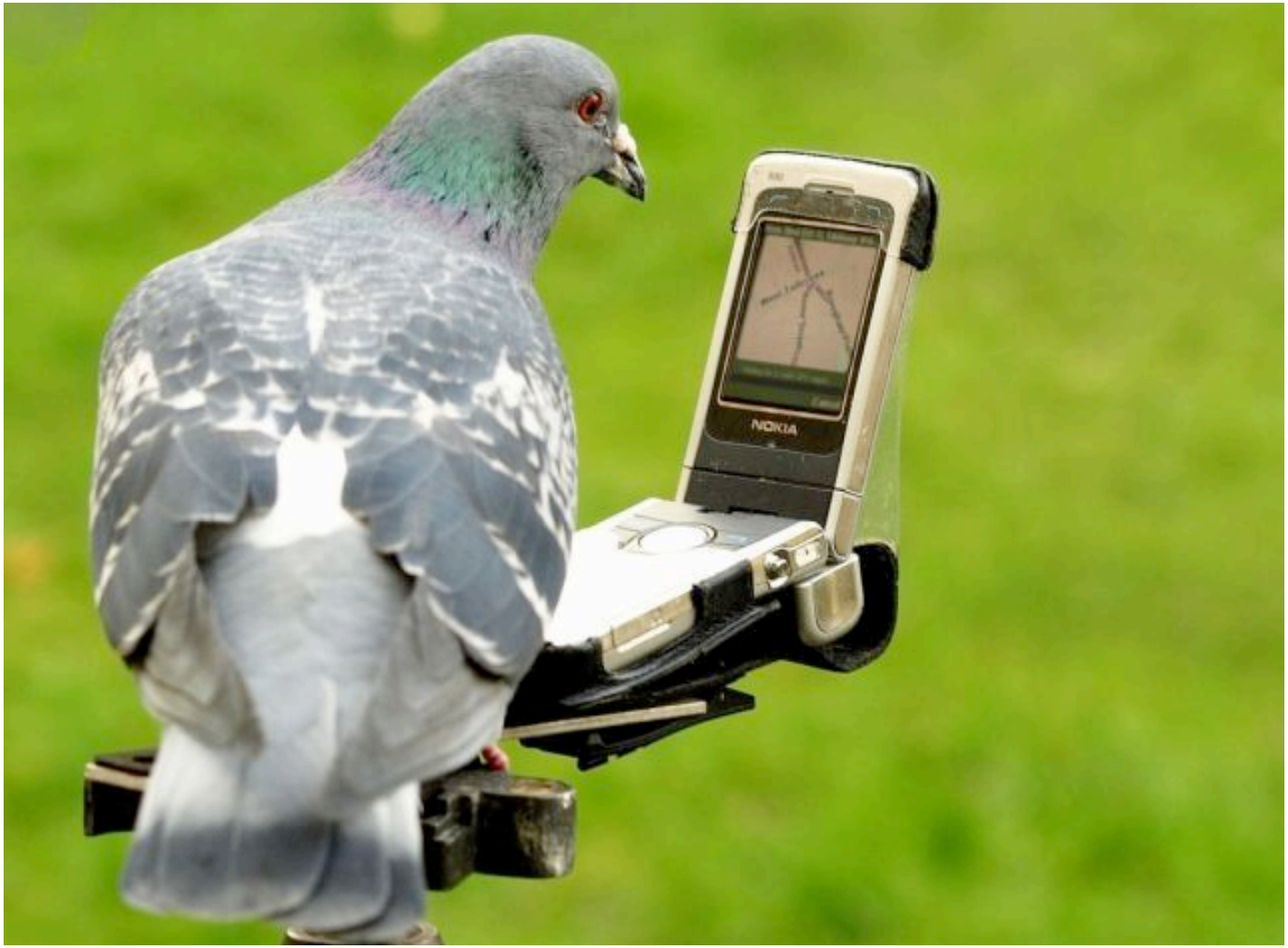
Pollination research

Native bee species are very diverse:

How can insecticides impact native pollinators?

- Can be result of acute lethal dose—bee dies
- Or, could be sublethal—affects normal functioning and physiology
  - effect of a sublethal dose of Admire (imidacloprid) on homing behavior in bumble bees
  - Imidacloprid is a neurotoxin

How do animals relocate home?



Bees may forage >2 miles from nest: may relocate nest by learning features on the horizon plus landmarks

Design: sublethal effect of neurotoxic insecticide on homing success in bumble bees

- Set up Koppert bumble bee hives in the lab
- Allowed workers to exit/return via tygon tubes for 2 wks
- Treated half with 5 nanograms (ng)/bee of imidacloprid

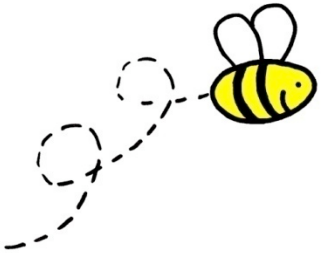
Imagining dose
Bee data : expressed in ng/bee

- 1 nanogram = **1 ng**
- 1ng = 1 billionth of a gram

5,000,000,000 ng

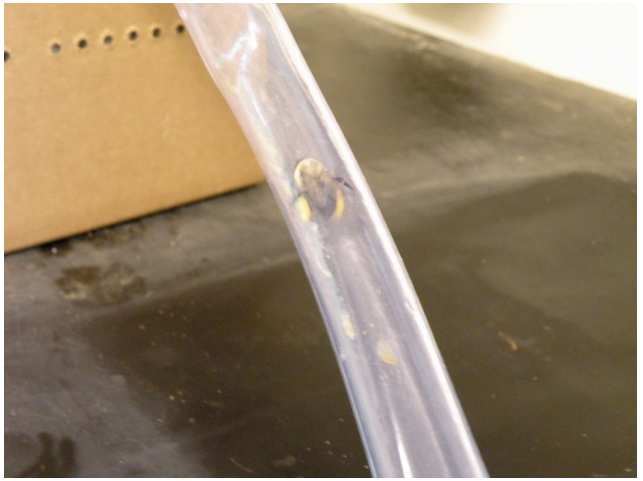
New chemistries : honey bee acute contact LD_{50}

	compound
Most toxic	Admire (imidacloprid) ←
↓	Actara (thiamethoxam)
	Delegate/SpinTor/Entrust
	Avaunt (indoxacarb)
	Lorsban (chlorpyrifos)
	Diazinon
	Assail (acetimiprid)
Less toxic	Intrepid, Confirm

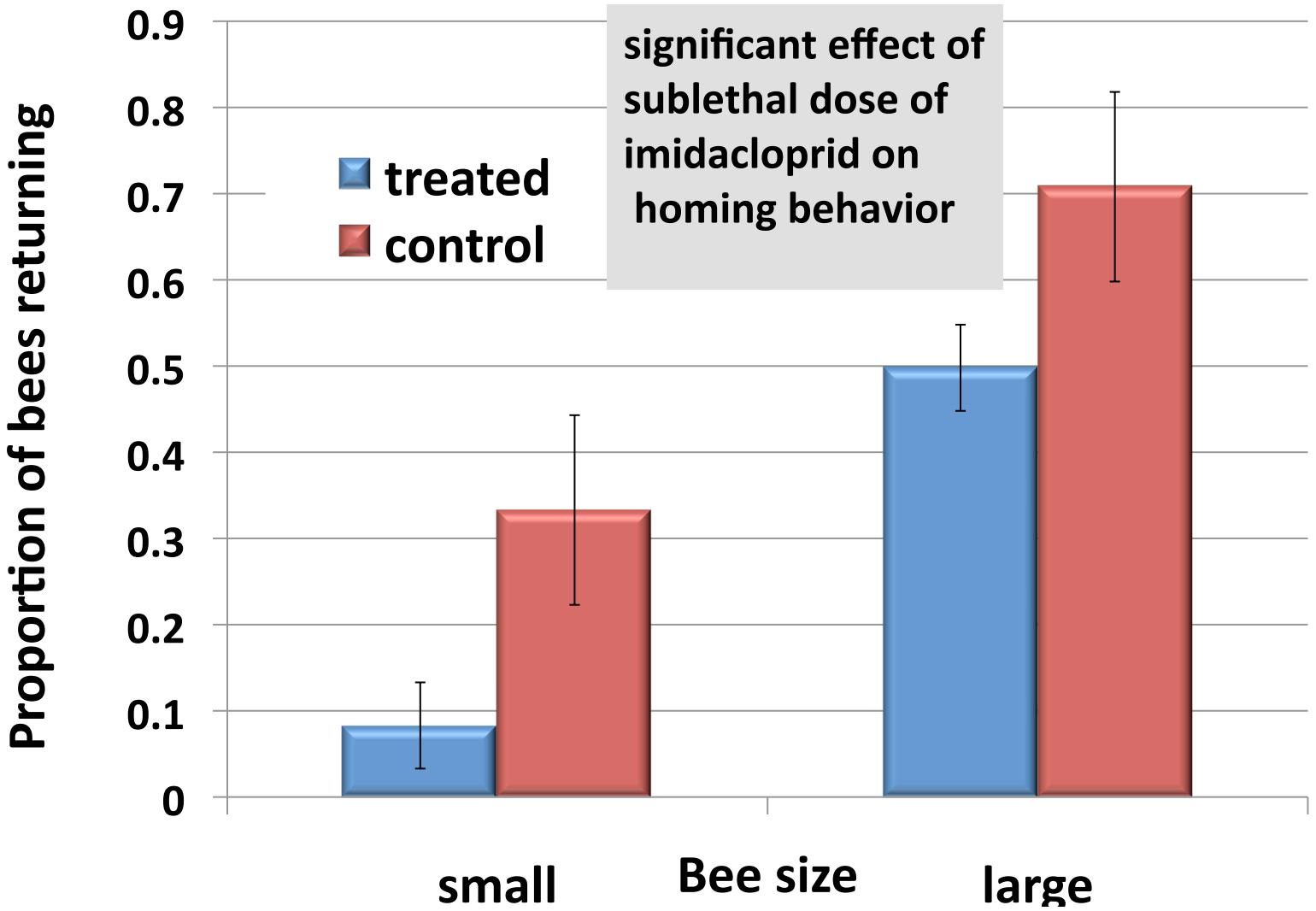


Design

- Treated ½ bees with sublethal dose:
  - 5 nanograms (ng) of imidacloprid
- Created two categories
  - large and small workers
- Treated and control bees were ‘displaced’
  - 0.3 mile from colony
- Successfully returning bees were recorded



Treated (blue) and control (red) workers returning when displaced from nest



New insecticide groups and bee health

- May be important part of the problem
  - High bee toxicity
  - Residual
  - Systemic (may move through plant to pollen/nectar)
- Small bees affected by smaller dose, logically
- Loss of habitat and forage also critical

Native bee species are diverse:
--- are usually small, need pollen/ nectar and specific nest sites

Another question

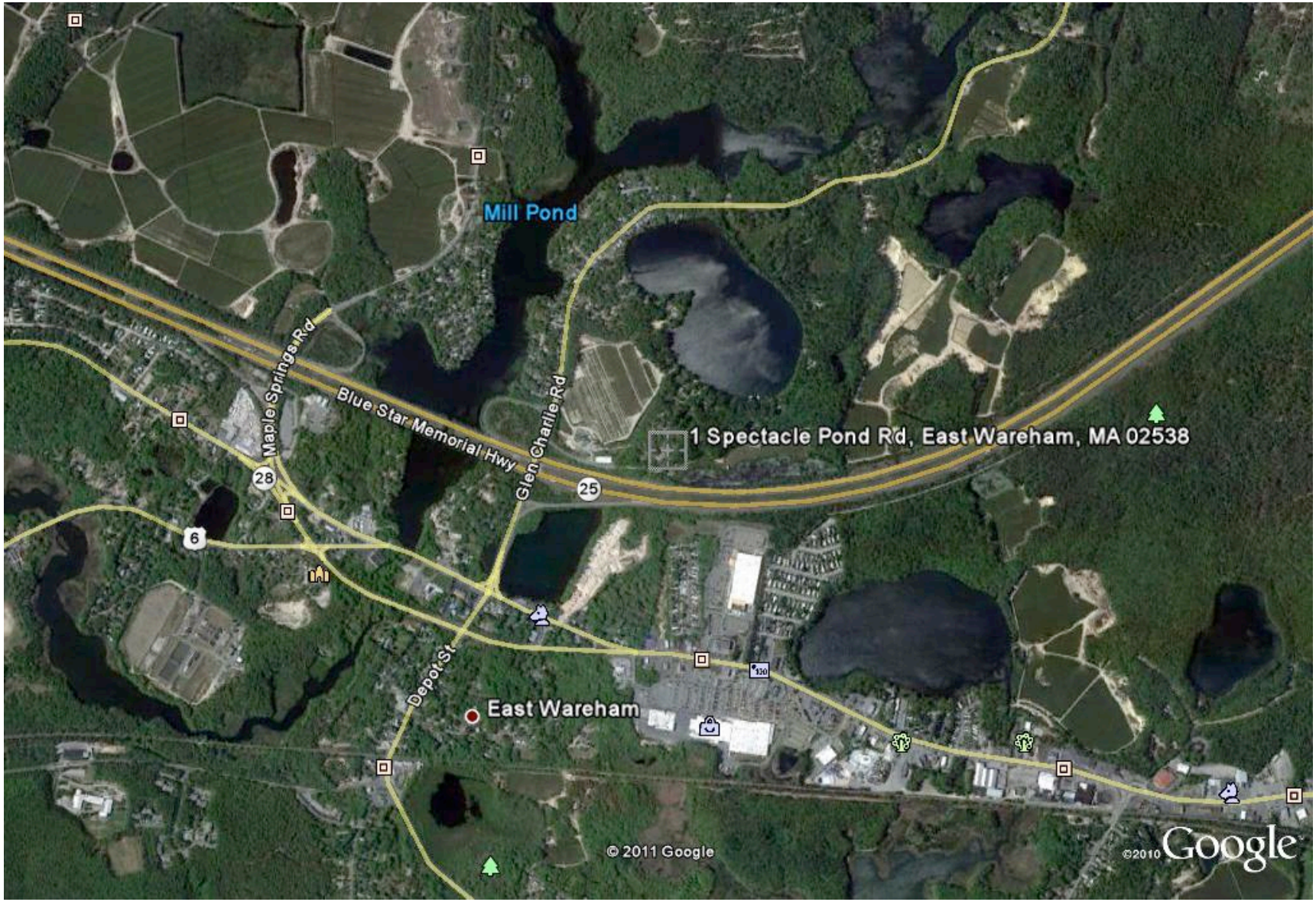
- Cranberry habitats don't have many good landmarks
- So, is it harder to relocate nest in cranberry habitat vs. habitat with lots of landmarks?

Design

- Compared homing success in cranberry bog vs. college campus setting, using bumble bees again as before
- After cranberry bloom over

- Called bog ‘agricultural’
- Called campus ‘urban’

- Bees were displaced 0.3, 0.6, and 1.2 miles from colony
- Successfully returning bees were recorded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Blue Star Memorial Hwy
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28
25
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Depot St
East Wareham
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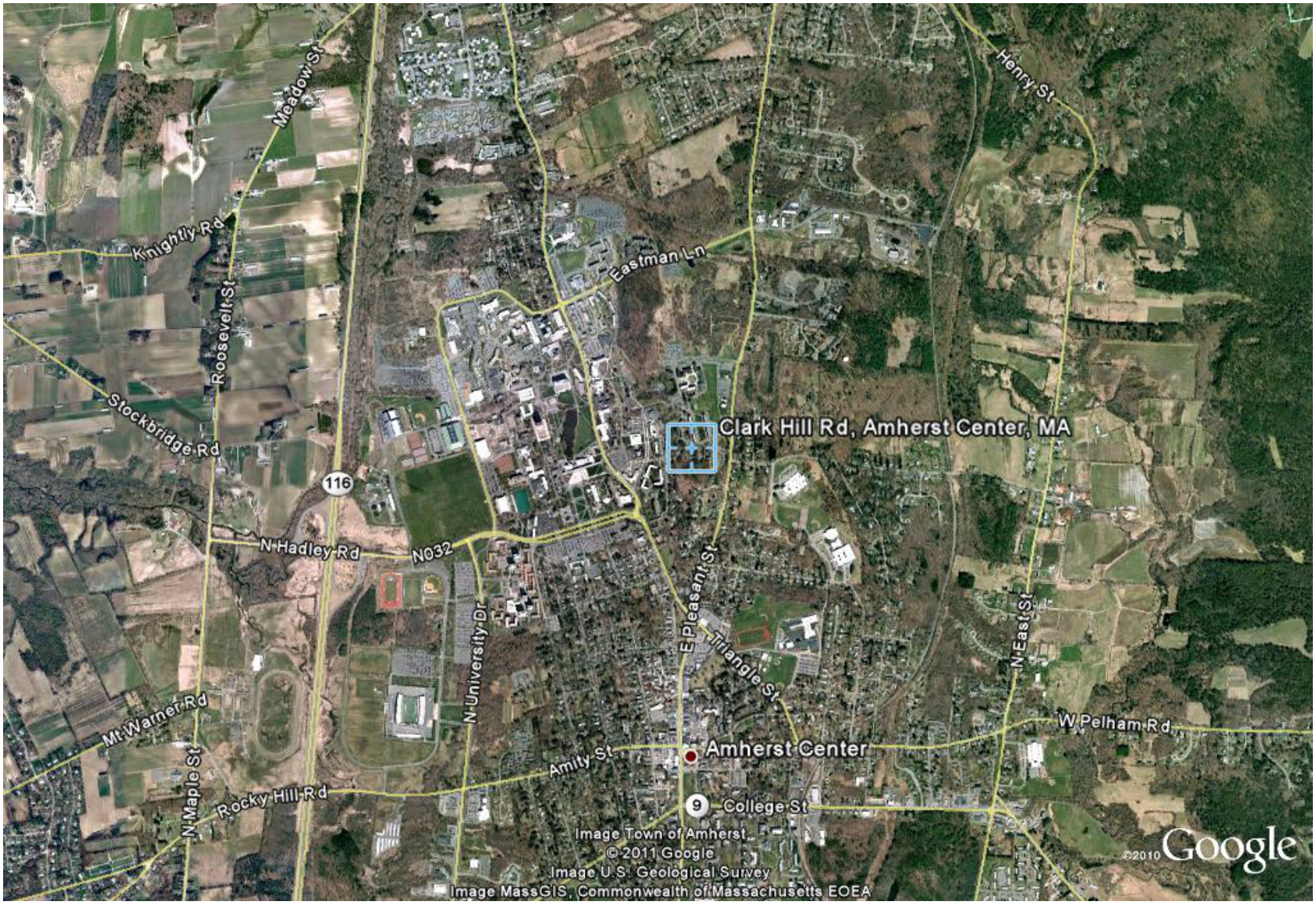
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N University Dr
E Pleasant St
Triangle St
N East St
Mt Warner Rd
W Pelham Rd
Amherst Center
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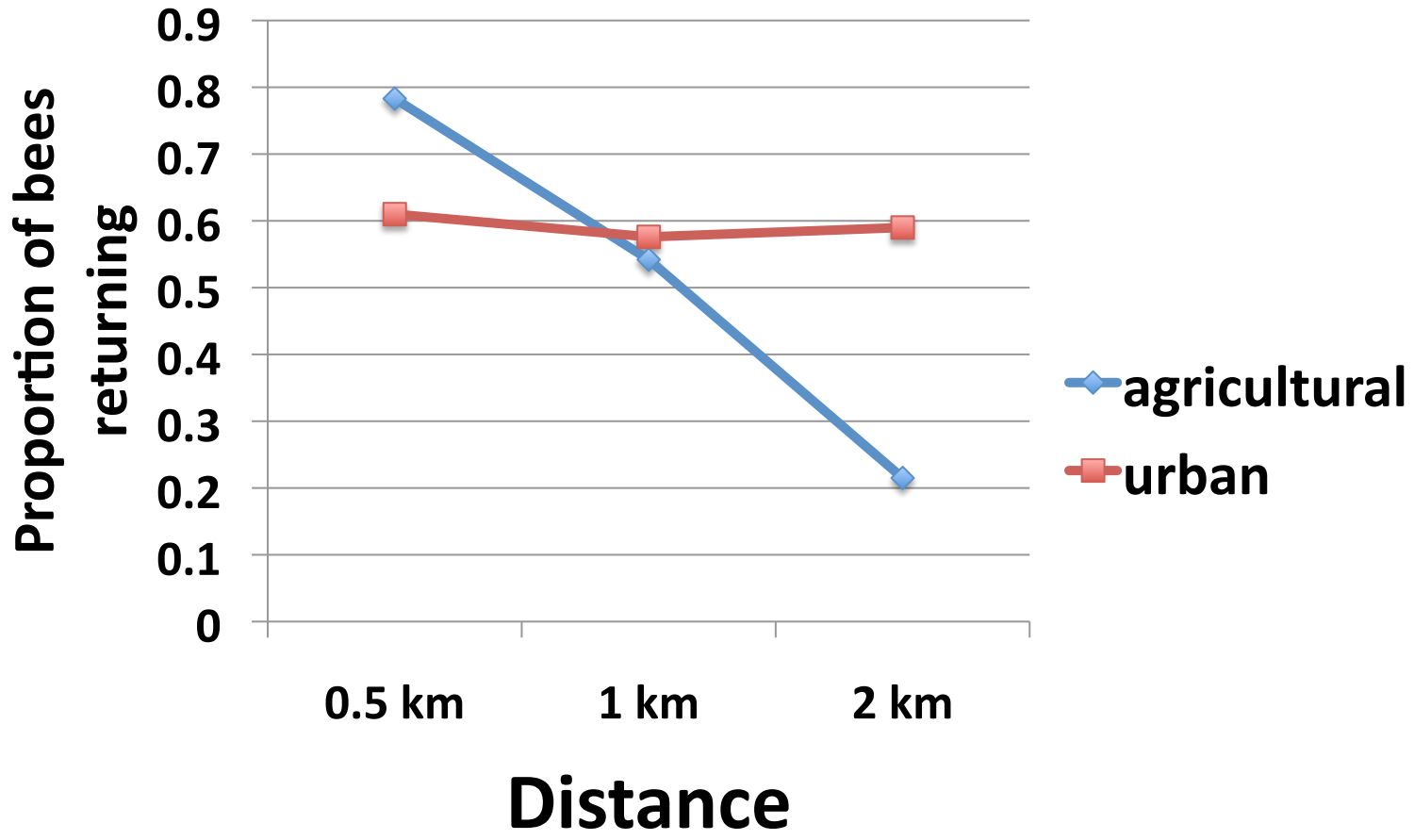
Homing success drops off sharply in bog setting: suggests it may be harder to navigate in featureless habitat



If so, perhaps bees in ag settings face dual disadvantages, when returning from foraging, since they must deal with featureless monoculture landscape plus possible neurotoxic insecticide exposure

How are managed honey bees doing?

Pollen collections for insecticide screen—*bumble bees*

Pollen load removed and bees released

We found many pesticides in pollen from bumble bees collected in cranberry bogs

- Foraging bees bring pollen back to colony to rear young
- Compounds identified were not all from bog applications